

Construction Research Program

Goal 1 - Reduce Fatal and Nonfatal Injuries:
Nail Gun Injuries in Residential Construction

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WORKPLACE SAFETY AND HEALTH



Issue

- Nail guns used for over 30 years in residential frame construction
- Multiple case reports in injury literature
- Very little population-based research



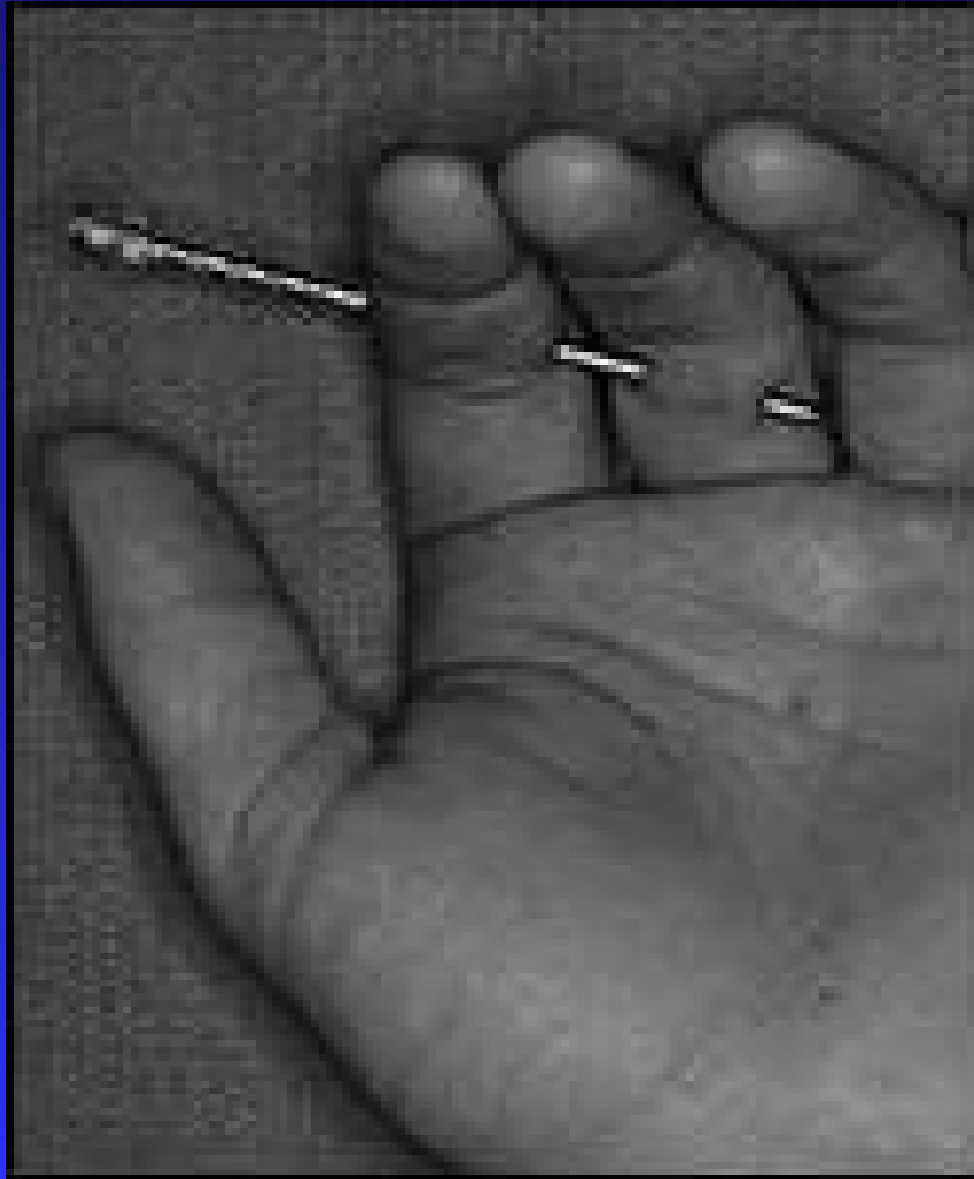
Issue

'Epidemic of nail gun injuries'

- 14% of residential carpentry injuries
- > 3 times higher rates among apprentices than journeymen **in part due to greater exposure**
 - ◆ Ease of use
 - ◆ Considered an unskilled task
- Majority of injuries are not reported

Issue

Common Nail Gun Injury to the Fingers



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U.S.

Nail embedded in man's skull for 6 days

Monday, January 17, 2005 Posted: 7:48 AM EST (1248 GMT)

LITTLETON, Colorado (AP) -- A dentist found the source of the toothache Patrick Lawler was complaining about on the roof of his mouth -- a four-inch (10-centimeter) nail the construction worker had unknowingly embedded in his skull six days earlier.

A nail gun backfired on Lawler, 23, on January 6 while working in Breckenridge, a ski resort town in the central Colorado mountains. The tool sent a nail into a piece of wood nearby, but Lawler didn't realize a second nail had shot through his mouth, said his sister, Lisa Metcalfe.

Following the accident, Lawler had what he thought was a minor toothache and blurry vision. On Wednesday, after painkillers and ice didn't ease the pain, he went to a dental office where his wife, Katerina, works.

"We all are friends, so I thought the (dentists) were joking ... then the doctor came out and said 'There's really a nail,'" Katerina Lawler said. "Patrick just broke down. I mean, he had been eating ice cream to help the swelling."

He was taken to a suburban Denver hospital, where he underwent a four-hour surgery. The nail had plunged 1 1/2 inches (4 centimeters) into his brain, barely missing his right eye, Metcalfe said.

"This is the second one we've seen in this hospital where the person was injured by the nail gun and didn't actually realize the nail had been imbedded in their skull," neurosurgeon Sean Markey told KUSA-TV in Denver. "But it's a pretty rare injury."

Lawler was recovering Sunday in the hospital, where he was expected to spend several more days.

Despite his lack of medical insurance and hospital bills between \$80,000 and \$100,000, Katerina Lawler said her husband is in good spirits.

"The doctors said, 'If you're going to have a nail in the brain, that's the way you want it to be,'" she said. "He's the luckiest guy, ever."



An X-ray image shows the four-inch nail embedded in Patrick Lawler's skull, narrowly missing his eye.

VIDEO

MP3 VIDEO

A dental X-ray finds the cause of a man's toothache -- a four-inch nail lodged in his skull.

[★ PLAY VIDEO](#)



Issue

- Two common trigger configurations:
 - ◆ Contact-trip – fires anytime the trigger is pulled and nose depressed
 - ◆ Sequential – fires only if nose element depressed before the trigger is pulled

68% of injuries with nail guns with contact trip triggers would not have occurred if they had had sequential trip triggers

External Factors

Misperceptions/concerns about sequential trigger

- It's new, and therefore unproven.
- It costs more.

Neither are true.



WORKPLACE SAFETY AND HEALTH



External Factors

- Cultural values in Construction
 - *acceptance of risk*
 - *pressures not to report injuries*
- Economic cost of speed
- Limitations of a voluntary ANSI standard
 - no evidence that it makes a difference.
- Regulation not on horizon



Activities

Active Injury Surveillance – St. Louis 1999-2003

- Objective: identify circumstances surrounding injuries of residential carpenters
- Process:
 - ◆ 20 large contractors reported injuries to the project office at Carpenters' District Council (3 million union carpenter hours per year/5000 residential carpenters)
 - ◆ Experienced journeymen interviewed injured workers

Opportunity to learn about the injuries from the perspective of the worker and from the perspective of an experienced carpenter investigator

Activities

St. Louis Active Injury Surveillance Project

Demonstrated:

- Importance of smaller scale surveillance efforts targeted to well-defined work groups (like residential carpenters)
- Utility of collaborative research – particularly with carpenters
 - ◆ High response rates
 - ◆ Viewed as credible researchers
 - ◆ Obtained detailed information
 - ◆ Reliable and valid data

Activities

Evaluation of Prevention Efforts

- Does training of apprentices make a difference?
- Does the **ANSI** standard, effective in May of 2003, matter?
 - ◆ Are sequential trigger tools actually getting into carpenters' hands on work sites?
 - ◆ What factors influence contractors as they make tool choices?
 - ◆ Do we see fewer injuries from contact trip tools?

Activities

Evaluation of Prevention Efforts

Demonstrated:

**Adjusted rate ratios
(95% CIs)**

Contact trip vs sequential trigger **2.0 (1.2, 3.3)**

No training vs training in tool use **2.9 (1.9, 4.4)**

Contact triggers accounted for 60+% of hours of tool use

Only 18% of carpenters had no training

Activities

Evaluation of Prevention Efforts

Demonstrated/confirmed:

- Awareness of ANSI standard change low among contractors
- Contractors largely attribute risk to worker error – “failure to pay attention”
- Contractor concerns about increasing risk of repetitive motion injuries related to sequential trigger use
- Contractor and carpenter concerns that sequential trigger will slow work down too much

Activities

Surveillance Data Analysis (1991-2003)

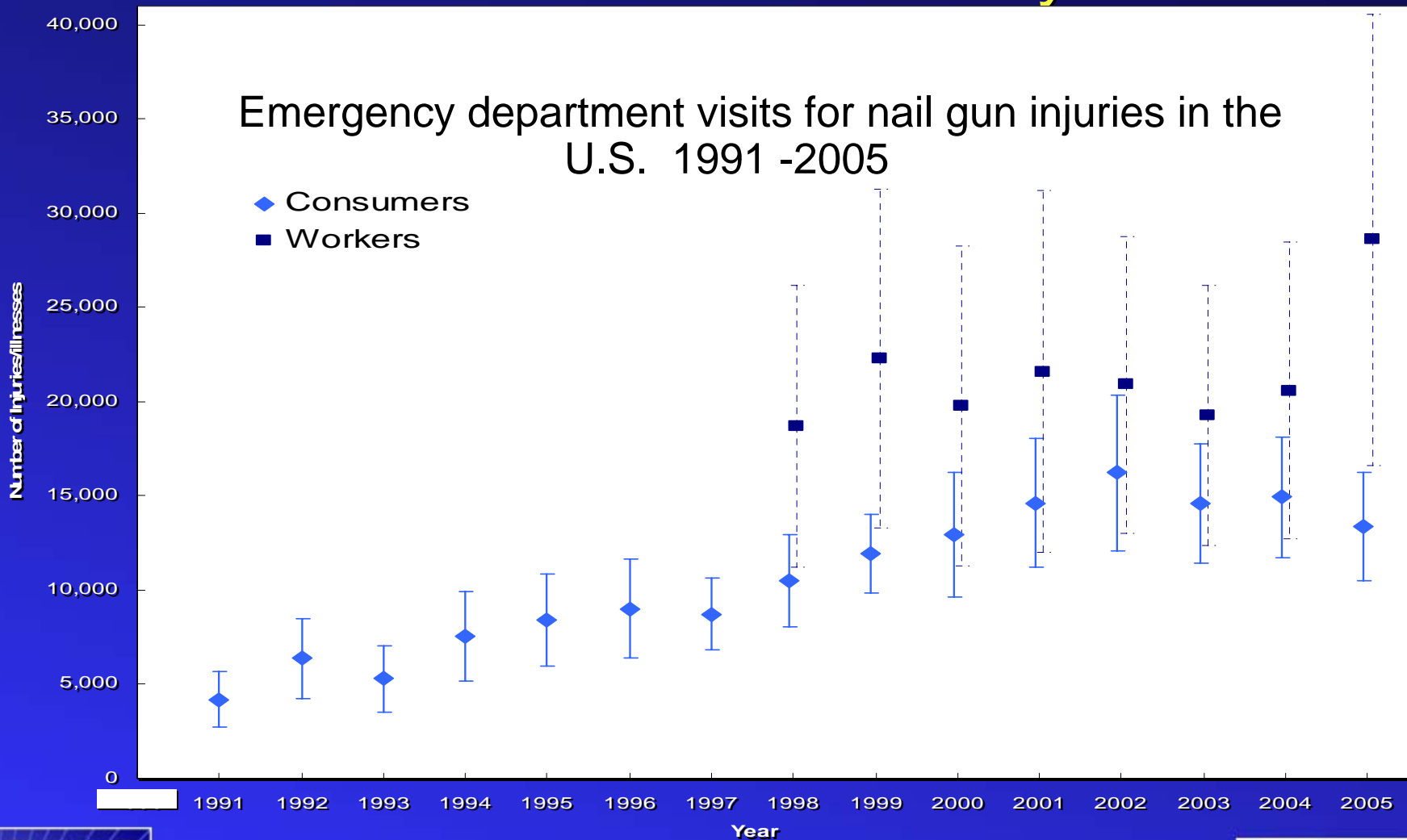
- National Electronic Injury Surveillance System data from Consumer Product Safety Commission
 - ◆ emergency department visits secondary to nail gun injuries
 - ◆ probability sample of U.S. hospitals participate allowing calculation of national estimates

Activities

Surveillance Data Analysis

Emergency department visits for nail gun injuries in the U.S. 1991 -2005

◆ Consumers
■ Workers



Outputs

- Publications
 - ◆ Residential construction surveillance - AOEH
 - ◆ Nail gun surveillance (2); passive and active – AOEH, Injury Prevention
 - ◆ Risk factor – AJIM
 - ◆ NEISS data analysis – MMWR
- Presentations
 - ◆ Peer-reviewed
 - National Occupational Injury Research Symposium
 - American Public Health Association
 - Epidemiology in Occupational Health
 - National Occupational Research Agenda Symposium
 - ◆ Invited
 - Center for Innovation in Construction Safety and Health, Virginia Polytechnic Institute and State University;
 - National Safety Council

Outputs

- Trade Publications
 - ◆ *Carpenter Magazine* – United Brotherhood of Carpenters and Joiners of North America
 - ◆ *Cutting Edge* – Carpenters District Council - St Louis
 - ◆ Homebuilders Association newsletter - St Louis
 - ◆ Online construction journal, *Light Construction*
 - ◆ *This Old House* magazine
- Presentations
 - ◆ Union training school instructors in St Louis and S. Illinois
 - ◆ Homebuilders' Association - St Louis
 - ◆ Health and Safety Conference (3 years) – U. Missouri
 - ◆ Construction Health and Safety Consortium Symposium
 - ◆ Joint meeting with tool association, trainers, contractor reps

Outputs

Findings shared with:

- Union
- Homebuilders
- Apprenticeship trainers
- Tool association (International Staple and Nail Tool Association)

Intermediate Outcomes

- Initiation of training in nail gun use for early apprentices
 - ◆ unexpected concerns about trainee injury

Intermediate Outcomes

- 2003 - International Staple and Nail Tool Association sponsored voluntary ANSI standard change
 - ◆ Framing nailers to be shipped with sequential triggers
- Many tools with contact trips remain in the workplace
- Contact trips are still available – in fact, they are shipped in the same box

Intermediate Outcomes

- Journeymen investigators address union locals about nail gun safety -- but broader safety issues as well – investigators have become a resource to their membership
- Apprenticeship instructor addressed Missouri OSHA
- Talked with OSHA investigators in recent death in Idaho
- School programs in Michigan high schools evaluating training in nail gun use for construction classes
- Litigation questions arising

Intermediate Outcomes

Press from recent MMWR release on NEISS emergency room injury data

- Picked up by Associated Press –
 - ◆ US Newspapers; > 250 at last count in over 30 states
- Foreign reports – Canada, Romania, India, Caribbean; radio and newspaper
- ABC's Good Morning America
- National Public Radio health report
- CDC podcast online

Increased consumer awareness – secondary benefit

End Outcomes

- Reduction in exposure – seeing more hours of work with sequential trigger tools
- **Reduction in injuries(>20%)** – preliminary 2006 data analysis shows reduction in rates of injury among apprentice carpenters
 - ◆ Relative risk comparing triggering mechanisms remains the same... reassures us about our data validity

What's Ahead

- Ongoing evaluation of training effect and ANSI standard effect
- Final analyses and reporting on productivity differences between contact and sequential trigger tools
 - ◆ Do the sequential triggers slow carpenters down once they are used to using them?
 - ◆ Do you use more nails with contact trip tools because of unintentional firings?
 - ◆ Is construction quality any different?
- Continued monitoring of injuries from repetitive use
- Continued diffusion